

## PATENT ABSTRACTS OF JAPAN

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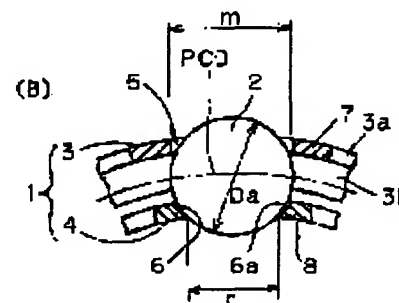
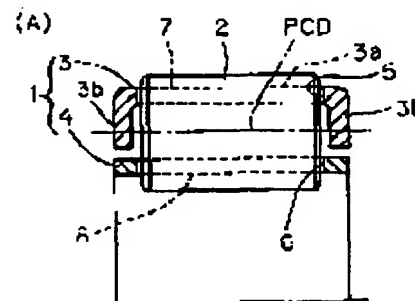
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## (54) NEEDLE ROLLER HAVING HOLDER, AND REDUCTION GEAR USING IT

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a needle roller having a holder capable of obtaining a large load capacity in a limited space, excellent in the roller guide function, the strength and the accuracy, and free from any troubles when the holder is brought into slidable contact with adjacent parts such as a planetary gear on a crank shaft.

**SOLUTION:** A needle roller having a holder is provided a holder 1 comprising an external member 3 and an internal member 4, and a roller 2. The external member 3 is provided with an annular part 3a whose diameter is larger than a pitch circle diameter PCD of the roller array, and a flange part 3b both end parts of which are folded inwardly. The internal member 4 is formed annular and smaller in diameter than the pitch circle diameter PCD of the roller array. Pockets 5, 6 are provided in the external and internal members 3, 4 to accommodate the roller 2. The flange part 3b may be provided on the internal member 4 instead of the external member 3.



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**CLAIMS**


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**[Claim(s)]**

[Claim 1] It has the cage which consists of a member and an inner direction member the outside direction, and time, the method member of the outside of the above It has the annular section of a major diameter, and the flange which bent the shaft-orientations both ends of this annular section to the bore side from the pitch diameter of a roller array, the method member of the inside of the above — time — the pitch diameter of an array — annular [ of a minor diameter ] — forming — the method of the outside of the above — the annular section of a member, and the inner direction — two or more circumferencial directions of a member — a pocket — preparing — the method of these outsides — the needle with a cage which held the above-mentioned time over the pocket of a member a member and the inner direction

[Claim 2] It has the cage which consists of a member and an inner direction member the outside direction, and time, and the method member of the outside of the above is formed in annular [ of a major diameter ] from the pitch diameter of a roller array, the method member of the inside of the above It has the annular section of a minor diameter, and the flange which bent the shaft-orientations both ends of this annular section to the outer-diameter side from the pitch diameter of a roller array, the method of the outside of the above — a member and the inner direction — two or more circumferencial directions of the annular section of a member — a pocket — preparing — the method of these outsides — the needle with a cage which held the above-mentioned time over the pocket of a member a member and the inner direction

[Claim 3] The needle with a cage according to claim 1 or 2 characterized by the pocket configuration of the member of a side flange-less among members being a roller guidance configuration a member and the inner direction the direction outside the above.

[Claim 4] The needle with a cage according to claim 1 to 3 to which the member of a side flange-less among members rounds off a strip, and welds ends a member and the inner direction the direction outside the above.

[Claim 5] The needle with a cage according to claim 1 to 4 whose member of a side with a flange the member of a side flange-less among members consists of synthetic resin a member and the inner direction the direction outside the above, and is metal material.

[Claim 6] The needle with a cage according to claim 1 to 5 installed between the crankshafts which support the epicyclic gear in an epicycle reduction gear, and this epicyclic gear.

[Claim 7] the epicycle reduction gear characterized by providing the following — setting — the above-mentioned needle with a cage — the method of outside — with the cage which consists of a member and an inner direction member It constitutes at the time of the plurality which is held in the pocket prepared in two or more hoop directions of a member a member and the inner direction these outside direction, and rolls between the above-mentioned epicyclic gear and a crankshaft, the method of the outside of the above — the annular section of a major diameter and the annular section of a minor diameter constitute a member and an inner direction member from the pitch diameter of an array at the each time — having — the method of these outsides — among members one member a member and the inner direction the shaft-orientations ends of the above-mentioned annular section — the member of another side — the epicycle reduction gear which shall have the flange prolonged in the direction of a path to a side The sun gear of an internal tooth or an external tooth. The carrier formed in this sun gear and this heart free [ rotation ]. The crankshaft which has two or more eccentric shanks which are supported by this carrier free [ rotation ] and adjoin it. Two or more epicyclic gears which are installed in each aforementioned eccentric shank of this crankshaft through a needle with a cage, and mesh with the aforementioned sun gear.

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the needle with a cage which obtains the maximum load-carrying capacity in a fixed space, and the epicycle reduction gear using this.

[0002]

[Description of the Prior Art] Although there is the total roller form as bearing which obtains the maximum load-carrying capacity in a fixed space, there is badness of the trouble on handling, i.e., assembly, and the handling nature at the time of decomposition, and the functional problem by the skew is inherent at the time in use. In order to solve these problems, the needle with a cage is proposed variously. In order that a cage may hold time, it escapes from it at the time to an outside, and an omission stop makes it required at a stop and the time to the inside.

[0003] The cage shown in drawing 7 shows the example. The cage 70 of this drawing serves as [ pitch diameter / PCD ] the central annular section 71 of a minor diameter from the way annular-outside major diameter section 72, and the flanges 73 and 73 bent from the method of outside annular section 72 at the bore side from the pitch diameter PCD in cross-section M type at the time at nothing and the time. This cage 70 is the method of outside annular section 72 about the omission stop to a way outside a roller 74, and performs the omission stop to the inner direction by the central annular section 71. That is, although the pocket 75 which holds a roller 74 in \*\*\*\*\*, such as a periphery of the annular sections 71 and 72, is formed, respectively, width of face of the piece 76 of a stop projected in this pocket 75 is slightly made smaller than the outer diameter of a roller 74. Wearing of a roller 74 is performed from an outer-diameter side by carrying out elastic deformation of the piece 76 of a stop of a pocket 75.

[0004]

[Problem(s) to be Solved by the Invention] If the number of 74 is made to increase and it goes in a fixed space (a fixed bore, outer diameter) when including in a cage 70, the limitation on processing not only comes out, but the column-width size of a drawing 7 (B) will become small, and cage intensity will fall. Therefore, the cage of composition of having differed fundamentally [ a cage 70 like the example of this drawing ] is called for. Moreover, there is a demand of the flange area of a cage in the needle with a cage made to intervene between the epicyclic gear in an epicycle reduction gear, and a crankshaft. That is, in what put in order and installed the epicyclic gear of two sheets in the eccentric shank which a crankshaft adjoins, it \*\*\*\* with eccentric rotation of these eccentricity shank with the end panel of the epicyclic gear which the flange of a cage adjoins. Therefore, if there is no area of a flange to some extent, there is a possibility of interfering in the bore of the adjoining epicyclic gear.

[0005] The purpose of this invention is offering a convenient needle with a cage, when big load-carrying capacity can be obtained in a fixed space, and it excels also in a roller guidance function, an on-the-strength side, and a precision side and a cage \*\*\*\*s on contiguity parts. Other purposes of this invention are making formation of a roller slideway easy and aiming at improvement which is productivity. The purpose of further others of this invention is offering the epicycle reduction gear which there is no problem which interferes in the bore of an epicyclic gear and the epicyclic gear which the needle with a cage made to intervene between crankshafts adjoins, and can be excellent also in a roller guidance function, an on-the-strength side, and a precision side, and can obtain big load-carrying capacity in a fixed space, and can attain the miniaturization which is the whole equipment.

[0006]

[Means for Solving the Problem] the needle with a cage by which this invention is constituted from a cage and time — setting — a cage — the method of outside — it has each following feature on the basis of having considered as two parts of a member a member and the inner direction in the needle with a cage of invention of a claim 1, the method member of outside shall have the annular section of a major diameter, and the flange which bent the shaft-orientations both ends of this annular section to the bore side from the pitch diameter of a roller array. An inner direction member is formed in annular [ of a minor diameter ] from the pitch diameter at the time. the method of the outside of the above — the annular section of a member, and the inner direction — two or more circumferencial directions of a member — a pocket — preparing — the method of these outsides — the above-mentioned time is held over the pocket of a member a member and the inner direction In the needle with a cage of invention of a claim 2, the method member of outside is formed in annular [ of a major diameter ] from the pitch diameter of a roller array. An inner direction member shall have the annular section of a minor diameter, and the flange which bent the shaft-orientations both ends of this annular section to the outer-diameter side from the pitch diameter at the time. the method of the outside of the above — a member and the inner direction — two or more circumferencial directions of the annular section of a member — a pocket — preparing — the method of these outsides — the above-mentioned time is held over the pocket of a member a member and the inner direction

[0007] invention of these claims 1 and a claim 2 — each — a cage — the method of outside — a member and the inner direction — two parts of a member — writing — the time to an outside — escaping — a stop and the time to the inside — the function of an omission stop — the method of outside — a member and an inner direction member can be made to assign, respectively, and the function of each part material is simplified For this reason, the configuration of a member becomes simple a member and the inner direction the outside direction, manufacture becomes easy, and it becomes possible to raise the working limit of whether how far to be able to narrow a part for the pillar section between pockets. Thereby, a roller number can be increased as much as possible in a fixed space, and it can do with what has the maximum load-carrying capacity. Moreover, in this way, a guidance function also improves from a bird clapper that the configuration of a member is simple at the time, and it can do with the thing

excellent also in the on-the-strength side and the precision side a member and the inner direction the outside direction. Especially when the intensity of the pillar section of a member falls the severe inner direction of reservation of a pillar section width-of-face size, it is also possible to make board thickness of a member thicker than the method member of outside the inner direction, and the flexibility of optimal design becomes high. moreover, the method of outside — a member and the inner direction — either of the members — the member of another side — even when [ which prepared the flange which projects in a side ] can fold, and a certain amount of area can be secured to a flange, therefore a cage is installed in the crankshaft for epicyclic gear support etc. and it \*\*\*\*s on contiguity parts, the trouble of a cage interfering in the bore side of contiguity parts, such as an epicyclic gear, is lost

[0008] this invention — setting — the method of outside — a member and the inner direction — the pocket configuration of the member of a side flange-less among members — time — as a guidance configuration — being good. Thus, rolling-element guidance of a cage can be performed by considering as a roller guidance configuration. In this case, it writes as the member of a flange-less side, and a flange does not serve as an obstacle on the occasion of formation of a roller guidance configuration, but a roller guidance configuration can form a roller guidance configuration easily.

[0009] this invention — setting — the method of outside — a member and the inner direction, the member of a side flange-less among members may round off a strip, and may weld ends Since the member by the side of nothing is a simple annular solid in a collar, it is easily processible by using a strip, and it is also possible to narrow column width and a path can be further increased in the limited space at a roller number and the time.

[0010] this invention — setting — the method of outside — a member and the inner direction, the member of a side flange-less among members may consist of synthetic resin, and the member of a side with a flange may consist of metal material Thus, by considering as the product made of synthetic resin, a pillar section configuration can design free and can raise guidance nature, such as making a roller slideway into the configuration where the outer diameter at the time was met. Moreover, since the member made into the product made of synthetic resin is a member by the side of nothing in a collar, a pillar section configuration is not restricted for fabrication of a flange. furthermore, a collar — since the member by the side of \*\*\*\* is metal, it can secure intensity to the slide contact to a contiguity member

[0011] The needle with a cage of each above-mentioned composition of this invention may be installed between the epicyclic gear in an epicycle reduction gear, and the crankshaft which supports this epicyclic gear.

[0012] The carrier formed by the epicycle reduction gear of this invention free [ rotation to the sun gear of an internal tooth or an external tooth, this sun gear, and this heart ]. The crankshaft which has two or more eccentric shanks which are supported by this carrier free [ rotation ] and adjoin it. In the epicycle reduction gear equipped with two or more epicyclic gears which are installed in each aforementioned eccentric shank of this crankshaft free [ rotation ] through a needle with a cage, and mesh with the aforementioned sun gear, the above-mentioned needle with a cage is considered as the next composition. this needle with a cage — the method of outside — the cage which consists of a member and an inner direction member, and the method of these outsides — it constitutes at the time of the plurality which is held in the pocket prepared in two or more hoop directions of a member a member and the inner direction, and rolls between the above-mentioned epicyclic gear and a crankshaft the method of outside — the annular section of a major diameter and the annular section of a minor diameter constitute a member and an inner direction member from the pitch diameter of an array at the each time — having — the method of these outsides — a member and the inner direction — the inside of a member — one member — the shaft-orientations ends of the above-mentioned annular section — the member of another side — it shall have the flange prolonged in the direction of a path to a side Thus, the epicycle reduction gear which installed the epicyclic gear in the crankshaft needs to prevent interfering in the bore of an epicyclic gear and the epicyclic gear which the needle with a cage which intervenes between crankshafts adjoins. This prevention function can be obtained by the flange of a cage. moreover — although a large load is needed for support of an epicyclic gear and the supporter serves as a limited space in such an epicycle reduction gear — the way outside the above — according to the cage divided into 2 of a member members a member and the inner direction — the inside of such a limited space — time — a number — path increase can be aimed at at an increase or the time, and big load-carrying capacity can be obtained

[0013]

[Embodiments of the Invention] The needle with a cage concerning the 1st operation form of this invention is explained with drawing 1 and drawing 2. time this needle with a cage is as needlelike as a cage 1 — from 2 — becoming — a cage 1 — the method of outside — it consists of members 4 a member 3 and the inner direction A member 3 has annular section 3a of a major diameter, and flange 3b which bent the shaft-orientations both ends of this annular section 3a to the bore side from the path of the pitch circle PCD of a roller array the outside direction. A member 4 is formed in annular [ of a minor diameter ] from the path of the pitch circle PCD of a roller array the inner direction. These outside direction, annular section 3a of a member 3, and the inner direction, a member 4 is a cylinder-like thing and forms pockets 5 and 6 in two or more circumferential directions at equal intervals, respectively. 2 is held [ these outside direction ] over the pockets 5 and 6 of a member 4 at the above-mentioned time a member 3 and the inner direction. The portion between the \*\*\*\*\* pockets 5 of a member 4 and between pockets 6 serves as pillar sections 7 and 8 a member 3 and the inner direction the outside direction, respectively.

[0014] the way outside a side with a flange — a member 3 — the width of face m of a pocket 5 — time — the outer diameter Da of 2 — small — small — time — 2 — the method of outside — dropping out — a thing — preventing. The width of face n of a pocket 6 is similarly formed in a size slightly smaller than the outer diameter Da of a roller 2 for a side [ he has no collar ] the inner direction, and a member 4 also prevents that a roller 2 falls out in the inner direction. The pocket 6 of a member 4 is made into the roller guidance configuration the inner direction. That is, this pocket 6 is formed in inclined plane 6a in which the pocket inside of circumferential direction both sides holds a roller 2. This inclined plane 6a is performing field push by press working of sheet metal, and after keeping being based on press working of sheet metal of a pocket 6 etc. like drawing 2 (A) and performing processing, as shown in this drawing (B), it is formed in inclined plane 6a. Moreover, the member 4 is annularly made by rounding off strips, such as a steel plate, and welding both ends the inner direction. A pocket 6 is processed before rounding off. A member 3 is a pressed part by draw forming of metal plates, such as a steel plate, etc. the outside direction. Moreover, a member 3 is considered as outer-diameter guidance the outside direction.

[0015] Thus, with constituting a cage 1, it makes it possible to hold a number at a path and the greatest time at the maximum time in the limited space.

[0016] Drawing 3 shows the 2nd operation form. the needle with a cage of this operation form — the inner direction — a member — except 4A, since it is the same as the 1st operation form, the same sign is given to a corresponding point and the explanation is omitted the inner direction — a member — 4A is formed by carrying out injection molding of the synthetic resin — having — pocket 6A — time — 2 — it is formed in curved-surface 8b of a circular cross-section configuration along the outer-diameter

side the inner direction — a member — lobe 8a which projects to an outer-diameter side rather than the portion of crosswise edges on both sides is prepared in pillar section 8 of 4A, and side 8b of this lobe 8a is formed in the curved surface of the above-mentioned circular cross-section configuration. In addition, you may form the whole surface of the both-sides side of not only lobe 8a but pocket 6A in the curved surface of a circular cross-section configuration along the outer-diameter side of a roller 2.

[0017] Drawing 4 shows the 3rd operation form, the needle with a cage of this operation form — so to speak — the way outside the 1st operation form — composition with a member 4 is made reverse a member 3 and the inner direction the method of outside — a member — 3B — time — an array — it forms in annular [ of a major diameter ] from the path of a pitch circle PCD the inner direction — a member — 4B — time — an array — a minor diameter is more nearly annular than a pitch diameter PCD — section 4Ba — this — annular — it has flange 4Bb which bent the shaft-orientations both ends of section 4Ba to the bore side the method of these outsides — member 3B and the inner direction — a member — 4B is annular — section 4Ba — two or more circumferential directions — regular intervals — Pockets 5B and 6B — respectively — preparing — both the pockets 5B and 6B — crossing — time — 2 — holding, a collar — the inner direction by the side of with — a member — 4B is taken as bore guidance (bearing washer guidance) — having — a collar — the method of the outside by the side of nothing — a member — the inside of pocket 5B is formed in inclined plane 5Ba, and 3B has become rolling-element guidance form

[0018] Drawing 5 and drawing 6 show an example adapting the needle with a cage of this invention of an epicycle reduction gear. This epicycle reduction gear has the sun gear 21 of an internal tooth, the carrier 22 used as the rotation output section, the crankshaft 23 that has two or more eccentric shanks 23a and 23b which are supported by this carrier 22 free [ rotation ] and adjoin it, two or more epicyclic gears 24 and 25 which are installed in each eccentric shanks 23a and 23b of this crankshaft 23 free [ rotation ], and mesh with a sun gear 21, and the rotation input section 26 which inputs rotation into a crankshaft 23. It is installed in housing 27 through bearing 28 ( drawing 6 ) so that it may be fixed to housing 27 and a carrier 22 can rotate a sun gear 21 freely to a sun gear 21 and this heart. The rotation input section 26 consists of a sun gear 21, an input shaft 29 of this heart, and a transfer gearing 30 that is prepared in each crankshaft 23 and meshes in the gearing section of an input shaft 29. The crankshaft 23 is formed in two or more circumferential directions (for example, three places) of a carrier 22. Epicyclic gears 24 and 25 are respectively installed in the eccentric shanks 23a and 23b of a crankshaft 23 through the needle 31 with a cage, as shown in drawing 6. The needle with a cage of either the needle 1st with a cage of this invention, for example, the above, and the 3rd operation gestalt is used for this needle 31 with a cage.

[0019] Operation of this epicycle reduction gear is explained. If the main input shaft 29 is rotated, through the transfer gearing 30, three crankshafts 23 will synchronize mutually and will rotate. Here, the 1st step of slowdown is performed. A crankshaft 23 and epicyclic gears 24 and 25 are connected through the needle 31 with a cage, and the circumference of the deflection of a crankshaft 23 synchronizes with synthetic movement of revolution in case epicyclic gears 24 and 25 turn around the inside of the sun gear 21 of an internal tooth, and rotation. The epicyclic gears 24 and 25 of two sheets on a par with shaft orientations revolve the inner circumference of the internal-tooth sun gear 21 around the sun, after 180-degree phase has shifted mutually. For this reason, the inertia force by the circumference of the deflection of epicyclic gears 24 and 25 of two sheets is negated mutually. The internal-tooth sun gear 21 is fixed and epicyclic gears 24 and 25 turn around the inner circumference of the internal-tooth sun gear 21. Three crankshafts 23 are caught among the disk sections 22a and 22b of two sheets of the carrier 22 used as an output member. Therefore, revolution of epicyclic gears 24 and 25 reaches a carrier 22 through revolution of a crankshaft 23, and slowed-down rotation is acquired.

[0020] A big load acts on the needle 31 with a cage to which the epicycle reduction gear of this composition intervened between epicyclic gears 24 and 25 and the crankshaft 23, and, moreover, the installation space of this needle 31 with a cage turns into a space restricted in order to avoid enlargement of the whole reduction gear. Moreover, the cage of this needle 31 with a cage \*\*\*\*s to the end panel of the adjoining epicyclic gears 24 and 25. however, the big load-carrying capacity in the limited space according to the needle with a cage of each above-mentioned operation gestalt — it can obtain — moreover, the method of outside — a member 3 or the inner direction — either of the members 4 — the member of another side — since it has flange 3b which projects to a side, the problem which interferes in the bore side of the epicyclic gears 24 and 25 does not arise by the slide contact to the end panel of the adjoining epicyclic gears 24 and 25 which carried out eccentricity, either

[0021]

[Effect of the Invention] Since the needle with a cage of this invention constituted the cage from two independent members of the method member of outside, and an inner direction member and the deflexion prevention function at the time to the method of outside and the inner direction was made to share with each member, Manufacture is easy, the limitation on processing is eased, in a fixed space, increase of a path can be aimed at at the increase in a roller number, and the time, and the maximum load-carrying capacity can be obtained, and a roller guidance function also improves, and it can do with the thing excellent also in the on-the-strength side and the precision side. And since the flange was prepared in one side of a member a member and the inner direction the outside direction, when a cage \*\*\*\*s on contiguity parts, interfering with the bore side of contiguity parts etc. is prevented. Though it is the composition of having made the needle with a cage intervening between an epicyclic gear and a crankshaft, the epicycle reduction gear of this invention does not have the problem to which a cage interferes in the bore of the adjoining epicyclic gear, and it can be excellent also in a guidance function, an on-the-strength side, and a precision side at the time in a needle with a cage, and can obtain big load-carrying capacity in a fixed space, and can attain miniaturization of the whole equipment.

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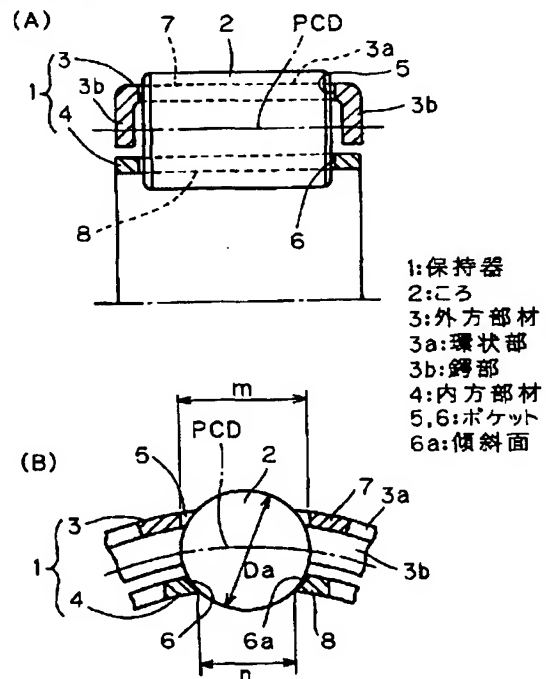
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(54) 【発明の名称】 保持器付き針状ころおよびこれを用いた減速装置

(57) 【要約】

【課題】 限られたスペース内で大きな負荷容量を得ることができ、ころ案内機能、強度面、精度面でも優れ、また保持器がクランク軸上の遊星歯車等の隣接部品と摺接する場合にも支障のないものとする。

【解決手段】 この保持器付き針状ころは、外方部材3および内方部材4からなる保持器1と、ころ2とを備える。外方部材3は、ころ配列のピッチ円PCDより大径の環状部3aと、その両端部を内径側に折曲した鏝部3bとを有する。内方部材4はころ配列のピッチ円PCDより小径の環状に形成する。外、内の部材3、4にポケット5、6を設け、ころ2を収容する。鏝部3bは、外方部材3に設ける代わりに内方部材4に設けても良い。



## 【特許請求の範囲】

【請求項 1】 外方部材および内方部材からなる保持器と、ころとを備え、上記外方部材は、ころ配列のピッチ円径より大径の環状部と、この環状部の軸方向両端部を内径側に折曲した鏝部とを有し、上記内方部材はころ配列のピッチ円径より小径の環状部に形成し、上記外方部材の環状部および内方部材の円周方向複数箇所にポケットを設け、これら外方部材および内方部材のポケットにわたって上記ころを収容した保持器付き針状ころ。

【請求項 2】 外方部材および内方部材からなる保持器と、ころとを備え、上記外方部材はころ配列のピッチ円径より大径の環状部に形成し、上記内方部材は、ころ配列のピッチ円径より小径の環状部と、この環状部の軸方向両端部を外径側に折曲した鏝部とを有し、上記外方部材および内方部材の環状部の円周方向複数箇所にポケットを設け、これら外方部材および内方部材のポケットにわたって上記ころを収容した保持器付き針状ころ。

【請求項 3】 上記外方部材および内方部材のうち、鏝部なし側の部材のポケット形状が、ころ案内形状となっていることを特徴とする請求項 1 または請求項 2 記載の保持器付き針状ころ。

【請求項 4】 上記外方部材および内方部材のうち、鏝部なし側の部材が、帯板を丸めて両端を溶接したものである請求項 1 ないし請求項 3 のいずれかに記載の保持器付き針状ころ。

【請求項 5】 上記外方部材および内方部材のうち、鏝部なし側の部材が、合成樹脂からなり、鏝部つき側の部材が金属材である請求項 1 ないし請求項 4 のいずれかに記載の保持器付き針状ころ。

【請求項 6】 遊星歯車減速装置における遊星歯車とこの遊星歯車を支持するクランク軸との間に設置される請求項 1 ないし請求項 5 のいずれかに記載の保持器付き針状ころ。

【請求項 7】 内歯または外歯の太陽歯車と、この太陽歯車と同心に回転自在に設けられたキャリアと、このキャリアに回転自在に支持されて隣接する複数の偏心軸部を有するクランク軸と、このクランク軸の前記各偏心軸部に保持器付き針状ころを介して設置されて前記太陽歯車に噛み合う複数の遊星歯車とを備えた遊星歯車減速装置において、上記保持器付き針状ころを、外方部材および内方部材からなる保持器と、これら外方部材および内方部材の周方向複数箇所に設けられたポケットに収容されて上記遊星歯車およびクランク軸の間で転動する複数のころから構成し、上記外方部材および内方部材は、各々ころ配列のピッチ円径よりも大径の環状部および小径の環状部に構成され、これら外方部材および内方部材のうち一方の部材は、上記環状部の軸方向両端に他方の部材側へ径方向に延びる鏝部を有するものとした遊星歯車減速装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】この発明は、一定のスペース内の最大の負荷容量を得る保持器付き針状ころ、およびこれを用いた遊星歯車減速装置に関する。

## 【0002】

【従来の技術】一定のスペース内で最大の負荷容量を得る軸受として総ころ形式があるが、取り扱い上の問題点、すなわち組立、分解時の取扱性の悪さがあり、また、使用中の、ころスキューによる機能的な問題が内在している。これらの問題を解決するため、保持器付き針状ころが種々提案されている。保持器は、ころを保持するため、外側へのころ抜け止めと、内側へのころ抜け止めが必要にする。

【0003】図 7 に示した保持器は、その一例を示す。同図の保持器 70 は、断面 M 形をなし、ころピッチ円径 PCD より小径の中央環状部 71 と、ころピッチ円径 PCD より大径の外方環状部 72 と、外方環状部 72 から内径側に折曲された鏝部 73、73 からなっている。この保持器 70 は、ころ 74 の外方への抜け止めを外方環状部 72 で、また内方への抜け止めを中央環状部 71 によって行う。すなわち、それぞれ環状部 71、72 の円周等配位置に、ころ 74 を収容するポケット 75 を形成しているが、このポケット 75 に突出した係止片 76 の幅を、ころ 74 の外径よりも僅かに小さくしている。ころ 74 の装着は、外径側から、ポケット 75 の係止片 76 を弾性変形させて行う。

## 【0004】

【発明が解決しようとする課題】一定スペース内（一定の内径、外径）で、保持器 70 に組み込むころ 74 の本数を増加させて行くと、図 7 (B) の柱幅寸法 a が小さくなり、加工上の限界が出て来るだけでなく、保持器強度も低下する。そのため、同図の例のような保持器 70 とは基本的に異なった構成の保持器が求められる。また、遊星歯車減速装置における遊星歯車とクランク軸間に介在させる保持器付き針状ころでは、保持器の鏝部面積の要求がある。すなわち、クランク軸の隣接する偏心軸部に 2 枚の遊星歯車を並べて設置したもので、これら偏心軸部の偏心回転に伴い、保持器の鏝部が、隣接する遊星歯車の幅面と摺接する。そのため、鏝部の面積がある程度なければ、隣接する遊星歯車の内径に干渉してしまう恐れがある。

【0005】この発明の目的は、一定のスペース内で大きな負荷容量を得ることができ、ころ案内機能、強度面、精度面でも優れ、また保持器が隣接部品と摺接する場合にも支障のない保持器付き針状ころを提供することである。この発明の他の目的は、ころ案内面の形成を容易とし、生産性の向上を図ることである。この発明のさらに他の目的は、遊星歯車とクランク軸間に介在させる保持器付き針状ころが、隣接する遊星歯車の内径に干渉する問題がなく、また、ころ案内機能、強度面、精度面



でも優れ、かつ一定のスペース内で大きな負荷容量を得ることができて、装置全体のコンパクト化が図れる遊星歯車減速装置を提供することである。

#### 【0006】

【課題を解決するための手段】この発明は、保持器とところで構成される保持器付き針状ころにおいて、保持器を、外方部材および内方部材の2部品としたことを基本とし、この他に次の各特徴を有するものである。請求項1の発明の保持器付き針状ころでは、外方部材は、ころ配列のピッチ円径より大径の環状部と、この環状部の軸方向両端部を内径側に折曲した鏝部とを有するものとする。内方部材は、ころのピッチ円径より小径の環状に形成する。上記外方部材の環状部および内方部材の円周方向複数箇所にポケットを設け、これら外方部材および内方部材のポケットにわたって上記ころを収容する。請求項2の発明の保持器付き針状ころでは、外方部材は、ころ配列のピッチ円径より大径の環状に形成する。内方部材は、ころのピッチ円径より小径の環状部と、この環状部の軸方向両端部を外径側に折曲した鏝部とを有するものとする。上記外方部材および内方部材の環状部の円周方向複数箇所にポケットを設け、これら外方部材および内方部材のポケットにわたって上記ころを収容する。

【0007】これら請求項1および請求項2の発明は、いずれも、保持器を外方部材および内方部材の2部品としたため、外側へのころ抜け止めと、内側へのころ抜け止めの機能を、外方部材および内方部材にそれぞれ分担させることができ、各部材の機能が簡略化される。このため、外方部材および内方部材の形状がシンプルとなり、製造が容易となつて、ポケット間の柱部分をどこまで狭くできるかの加工限界を上げることが可能となる。これにより、一定スペースでころ本数をできるだけ増やすことができ、最大の負荷容量を有するものとする。また、このように外方部材および内方部材の形状がシンプルとなることから、ころ案内機能も向上し、強度面、精度面でも優れたものとする。特に、柱部幅寸法の確保の厳しい内方部材の柱部の強度が低下する場合は、内方部材の板厚を外方部材よりも厚くすることも可能で、最適設計の自由度が高くなる。また、外方部材および内方部材のいずれか一方に、他方の部材側に突出する鏝部を設けたため、鏝部にある程度の面積が確保でき、そのため、保持器が遊星歯車支持用のクランク軸等に設置されて隣接部品と摺接するような場合でも、保持器が遊星歯車等の隣接部品の内径面に干渉する等の支障が無く

なる。

【0008】この発明において、外方部材および内方部材のうち、鏝部なし側の部材のポケット形状を、ころ案内形状としても良い。このように、ころ案内形状とすることで、保持器の転動体案内が行える。この場合に、ころ案内形状は、鏝部なし側の部材としたため、ころ案内形状の形成に際して、鏝部が障害とならず、簡単にころ

案内形状を形成することができる。

【0009】この発明において、外方部材および内方部材のうち、鏝部なし側の部材が、帯板を丸めて両端を溶接したものであってもよい。鏝部なし側の部材は、シンプルな環状体であるため、帯板を用いることで簡単に加工でき、柱幅を狭めることも可能で、限られたスペース内でより一層ころ本数、ころ径を増やすことができる。

【0010】この発明において、外方部材および内方部材のうち、鏝部なし側の部材が、合成樹脂からなり、鏝部付き側の部材が金属材料からなるものであっても良い。このように合成樹脂製とすることで、ころ案内面をころの外径に沿った形状にするなど、柱部形状が自在に設計でき、案内性を向上させることができる。また、合成樹脂製とする部材は鏝部なし側の部材であるため、鏝部の成形のために柱部形状が制限されることがない。さらに、鏝部あり側の部材は金属製であるため、隣接部材との摺接に対して強度が確保できる。

【0011】この発明の上記各構成の保持器付き針状ころは、遊星歯車減速装置における遊星歯車と、この遊星歯車を支持するクランク軸との間に設置されるものであっても良い。

【0012】この発明の遊星歯車減速装置は、内歯または外歯の太陽歯車と、この太陽歯車と同心に回転自在に設けられたキャリアと、このキャリアに回転自在に支持されて隣接する複数の偏心軸部を有するクランク軸と、このクランク軸の前記各偏心軸部に保持器付き針状ころを介して回転自在に設置されて前記太陽歯車に噛み合う複数の遊星歯車とを備えた遊星歯車減速装置において、上記保持器付き針状ころを次の構成としたものである。

この保持器付き針状ころは、外方部材および内方部材からなる保持器と、これら外方部材および内方部材の周方向複数箇所に設けられたポケットに収容されて上記遊星歯車およびクランク軸の間で転動する複数のころから構成したものである。外方部材および内方部材は、各々ころ配列のピッチ円径よりも大径の環状部および小径の環状部で構成され、これら外方部材および内方部材のうち一方の部材は、上記環状部の軸方向両端に他方の部材側へ径方向に延びる鏝部を有するものとする。このようにクランク軸に遊星歯車を設置した遊星歯車減速装置は、遊星歯車とクランク軸の間に介在する保持器付き針状ころが、隣接する遊星歯車の内径に干渉することを防止する必要がある。この防止機能を保持器の鏝部で得ることができる。また、このような遊星歯車減速装置において、遊星歯車の支持には大荷重が必要となり、またその支持部は限られたスペースとなるが、上記の外方部材および内方部材の2部材に分けた保持器によると、このような限られたスペース内でころ本数の増加やころ径増大を図ることができ、大きな負荷容量を得ることができる。

#### 【0013】



【発明の実施の形態】この発明の第1の実施形態にかかる保持器付き針状ころを、図1、図2と共に説明する。この保持器付き針状ころは、保持器1と針状のころ2とからなり、保持器1は、外方部材3および内方部材4で構成される。外方部材3は、ころ配列のピッチ円PCDの径より大径の環状部3aと、この環状部3aの軸方向両端部を内径側に折曲した鏝部3bとを有する。内方部材4は、ころ配列のピッチ円PCDの径より小径の環状に形成する。これら外方部材3の環状部3aおよび内方部材4は、円筒状のものであり、円周方向複数箇所に等間隔でポケット5、6をそれぞれ設ける。これら外方部材3および内方部材4のポケット5、6にわたって上記のころ2を収容する。外方部材3および内方部材4の隣合うポケット5間およびポケット6間の部分は、それぞれ柱部7、8となる。

【0014】鏝部付き側の外方部材3は、ポケット5の幅mが、ころ2の外径Daよりも僅かに小さく、ころ2が外方に脱落するのを防止する。鏝無し側の内方部材4も同様に、ポケット6の幅nが、ころ2の外径Daよりも僅かに小さい寸法に形成され、ころ2が内方に脱落するのを防止する。内方部材4のポケット6は、ころ案内形状とされている。すなわち、このポケット6は、円周方向両側のポケット内面が、ころ2を抱く傾斜面6aに形成されている。この傾斜面6aは、図2(A)のようにポケット6のプレス加工等による抜き加工が行われた後、プレス加工による面押しを行うことで、同図(B)のように傾斜面6aに形成される。また、内方部材4は、鋼板等の帯板を丸めて両端部を溶接することにより、環状に作られている。ポケット6は、丸める前に加工される。外方部材3は、鋼板等の金属板の絞り成形等によるプレス加工品である。また、外方部材3は、外径案内とされる。

【0015】このように保持器1を構成することで、限られたスペース内で、最大ころ径、最大のころ本数を収容することを可能としている。

【0016】図3は第2の実施形態を示す。この実施形態の保持器付き針状ころは、内方部材4A以外は、第1の実施形態と同じであるため、対応部分に同一符号を付してその説明を省略する。内方部材4Aは、合成樹脂を射出成形することによって形成されたものであり、ポケット6Aはころ2の外径面に沿った円弧状断面形状の曲面8bに形成されている。内方部材4Aの柱部8Aには、幅方向の両側縁の部分よりも外径側へ突出する突出部8aが設けられ、この突出部8aの側面8bが上記の円弧状断面形状の曲面に形成されている。なお、突出部8aだけでなく、ポケット6Aの両側面の全面をころ2の外径面に沿った円弧状断面形状の曲面に形成しても良い。

【0017】図4は第3の実施形態を示す。この実施形態の保持器付き針状ころは、いわば第1の実施形態の外

方部材3と内方部材4との構成を逆にしたものである。外方部材3Bは、ころ配列のピッチ円PCDの径より大径の環状に形成する。内方部材4Bは、ころ配列のピッチ円径PCDより小径の環状部4Baと、この環状部4Baの軸方向両端部を内径側に折曲した鏝部4Bbとを有する。これら外方部材3Bおよび内方部材4Bの環状部4Baには円周方向複数箇所に等間隔でポケット5B、6Bをそれぞれ設け、両ポケット5B、6Bにわたってころ2を収容する。鏝つき側の内方部材4Bは内径案内（軌道輪案内）とされ、鏝なし側の外方部材3Bは、ポケット5Bの内面が傾斜面5Baに形成され、転動体案内形式となっている。

【0018】図5、図6は、この発明の保持器付き針状ころを応用した遊星歯車減速装置の一例を示す。この遊星歯車減速装置は、内歯の太陽歯車21と、回転出力部となるキャリア22と、このキャリア22に回転自在に支持されて隣接する複数の偏心軸部23a、23bを有するクランク軸23と、このクランク軸23の各偏心軸部23a、23bに回転自在に設置されて太陽歯車21に噛み合う複数の遊星歯車24、25と、クランク軸23に回転を入力する回転入力部26とを有する。太陽歯車21はハウジング27に固定され、キャリア22は太陽歯車21と同心に回転自在なように、軸受28（図6）を介してハウジング27に設置されている。回転入力部26は、太陽歯車21と同心の入力軸29と、各クランク軸23に設けられて入力軸29の歯車部に噛み合う伝達歯車30とで構成される。クランク軸23は、キャリア22の円周方向複数箇所（例えば3箇所）に設けられている。遊星歯車24、25は、図6に示すように、各々保持器付き針状ころ31を介してクランク軸23の偏心軸部23a、23bに設置されている。この保持器付き針状ころ31に、この発明の保持器付き針状ころ、例えば上記第1ないし第3の実施形態のいずれかの保持器付き針状ころが用いられる。

【0019】この遊星歯車減速装置の動作を説明する。中心の入力軸29を回転させると、伝達歯車30を介して3本のクランク軸23が互いに同期して回転する。ここで、1段目の減速が行われる。クランク軸23と遊星歯車24、25とは、保持器付き針状ころ31を介して連結されており、クランク軸23の振れ回りは、遊星歯車24、25が内歯の太陽歯車21の内側を回るときの公転と自転の合成運動に同期する。軸方向に並ぶ2枚の遊星歯車24、25は、互いに180°位相がずれた状態で内歯太陽歯車21の内周を公転する。このため、2枚の遊星歯車24、25の振れ回りによる慣性力は打ち消し合う。内歯太陽歯車21は固定してあり、遊星歯車24、25は内歯太陽歯車21の内周を回る。3本のクランク軸23は、出力部材となるキャリア22の2枚の円盤部22a、22bの間に挟まっている。したがって、遊星歯車24、25の公転は、クランク軸23の公

転を通じてキャリア 22 に達し、減速された回転運動が得られる。

【0020】この構成の遊星歯車減速装置は、遊星歯車 24、25 とクランク軸 23 の間に介在した保持器付き針状ころ 31 に、大きな負荷が作用し、しかもこの保持器付き針状ころ 31 の設置スペースは、減速装置全体の大型化を避けるために限られたスペースとなる。また、この保持器付き針状ころ 31 の保持器は、隣接する遊星歯車 24、25 の幅面と摺接する。しかし、上記各実施形態の保持器付き針状ころによると、限られたスペース内で大きな負荷容量を得ることができ、また外方部材 3 または内方部材 4 のいずれかに、他方の部材側へ突出する鏝部 3b を有しているため、隣接する互いに偏心した遊星歯車 24、25 の幅面との摺接によっても、その遊星歯車 24、25 の内径面に干渉する問題が生じない。

【0021】

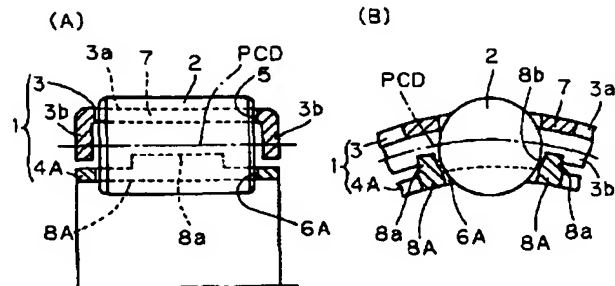
【発明の効果】この発明の保持器付き針状ころは、保持器を外方部材と内方部材との独立した 2 部材で構成し、外方および内方へのころの脱落防止機能をそれぞれの部材に分担させたため、製造が容易で加工上の限界が緩和され、一定のスペース内で、ころ本数の増加、ころ径の増大を図って最大の負荷容量を得ることができ、また、ころ案内機能も向上し、強度面、精度面でも優れたものとできる。しかも、外方部材および内方部材の一方には鏝部を設けたため、保持器が隣接部品と摺接する場合にも、隣接部品の内径面等と干渉することが防止される。この発明の遊星歯車減速装置は、遊星歯車とクランク軸間に保持器付き針状ころを介在させた構成でありながら、隣接する遊星歯車の内径に保持器が干渉する問題がなく、また、保持器付き針状ころにおけるころ案内機能、強度面、精度面でも優れ、かつ一定のスペース内で大きな負荷容量を得ることができて、装置全体のコンパクト化を図ることができる。

【図面の簡単な説明】

【図 2】



【図 3】



【図 1】(A) はこの発明の第 1 の実施形態にかかる保持器付き針状ころの部分破断側面図、(B) は同部分破断正面図である。

【図 2】その保持器のころ案内形状の成形過程を示す説明図である。

【図 3】(A) はこの発明の第 2 の実施形態にかかる保持器付き針状ころの部分破断側面図、(B) は同部分破断正面図である。

【図 4】(A) はこの発明の第 3 の実施形態にかかる保持器付き針状ころの部分破断側面図、(B) は同部分破断正面図である。

【図 5】同保持器付き針状ころを用いた遊星歯車減速装置の模式図である。

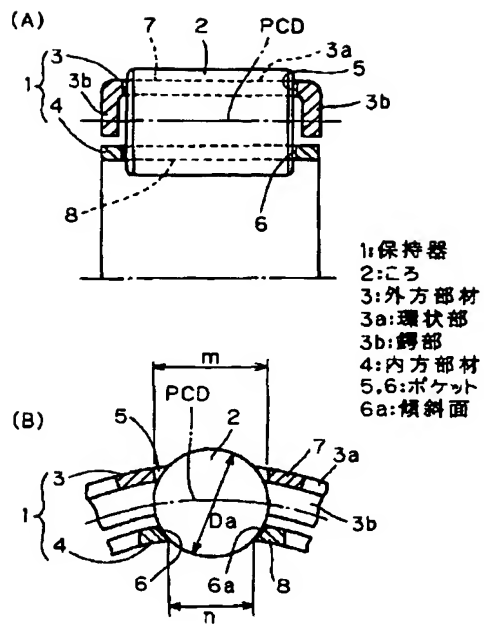
【図 6】同遊星歯車減速装置の部分切欠側面図である。

【図 7】(A) は従来の保持器付き針状ころの保持器の部分斜視図、(B) はその保持器付き針状ころの部分断面図である。

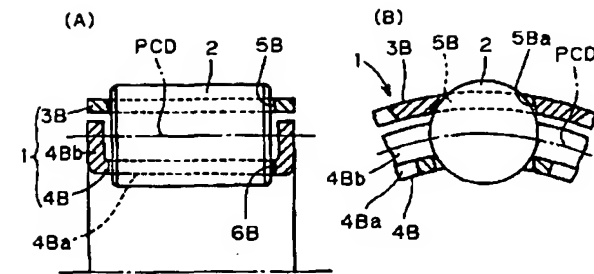
【符号の説明】

- 1 … 保持器
- 2 … ころ
- 3, 3B … 外方部材
- 3a … 環状部
- 3b … 鏝部
- 4, 4A … 内方部材
- 5, 6 … ポケット
- 6a … 傾斜面
- 21 … 太陽歯車
- 22 … キャリア
- 23 … クランク軸
- 23a, 23b … 偏心軸部
- 24, 25 … 遊星歯車
- 26 … 入力部
- 31 … 保持器付き針状ころ
- PCD … ピッチ円径

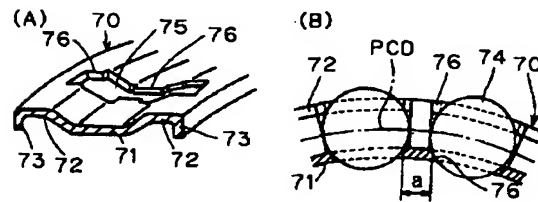
【図1】



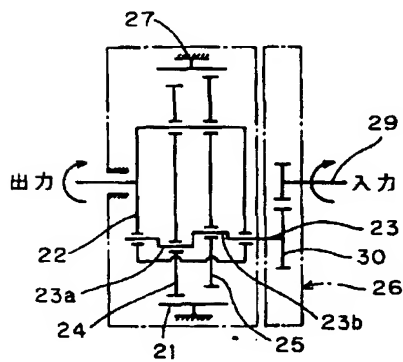
【図4】



【図7】



【図5】



【図6】

